

Patent Claims

1. A method for increasing the fatigue life, in particular the bending fatigue life and the torsional  
5 fatigue life of crankshafts, in particular of large crankshafts, by local hammering of highly loaded areas, such as grooves, hole mouths and cross-sectional junctions, by means of pulsed-pressure machines or striking apparatuses which introduce intrinsic  
10 compressive stresses into the crankshaft via striking tools,  
characterized in that  
the pulsed-pressure apparatuses or striking machines  
(1) carry out only a relative movement on a plane at  
15 right angles to the surface of the crankshaft segment at the time at which the compressive stress is introduced between the striking tool (14) and the crankshaft segment to be processed, with the crankshaft  
(4) being rotated continuously during the processing,  
20 and in that the time during which the striking tool (14) is acting and the striking pressures are chosen such that, when the striking tool (14) strikes the crankshaft segment to be processed while the intrinsic compressive stresses are being introduced, the  
25 rotational movement of the crankshaft (4) is necessarily stopped.

2. The method as claimed in claim 1,  
characterized in that  
30 the striking frequency of the striking tool (14) is between 0.1 and 20 Hz.

3. The method as claimed in claim 2,  
characterized in that  
35 the striking frequency of the striking tool (14) is between 1 and 10 Hz.

4. The method as claimed in claim 3,

characterized in that  
the striking frequency of the striking tool (14) is  
between 3 and 6 Hz.

- 5 5. The method as claimed in claim 1,  
characterized in that  
the striking pressures of the striking tool (14) are  
between 10 and 300 bar.
- 10 6. The method as claimed in claim 5,  
characterized in that  
the striking pressures of the striking tool (14) are  
between 30 and 130 bar.
- 15 7. The method as claimed in claim 6,  
characterized in that  
the striking pressures of the striking tool (14) are  
between 50 and 110 bar.
- 20 8. The method as claimed in one of claims 1 to 7,  
characterized in that  
the temperature in the region of the crankshaft segment  
to be processed is less than 65°C.
- 25 9. The method as claimed in claim 8,  
characterized in that  
the temperature in the region of the crankshaft segment  
to be processed is between 12 and 25°C.
- 30 10. The method as claimed in claim 1,  
characterized in that  
the intrinsic compressive stresses are introduced by  
means of the striking tools (14) on crankshafts (4)  
which have already previously been processed by a  
35 method for increasing the fatigue-life characteristics.
11. The method as claimed in claim 10,  
characterized in that

the intrinsic compressive stresses are introduced by the striking tools (14) after induction hardening of the crankshaft (4).

5 12. The method as claimed in one of claims 1 to 11, characterized in that,  
once the intrinsic compressive stresses have been introduced by the striking tools (14), the intrinsic compressive stresses close to the surface are reduced  
10 by machining away the surface of the crankshaft segment to be processed.

13. The method as claimed in claim 12, characterized in that  
15 up to 3 mm of the surface of the processed crankshaft segment is removed.

14. The method as claimed in claim 13, characterized in that  
20 between 0.3 and 2 mm of the surface of the processed crankshaft segment is removed.

15. The method as claimed in claim 12, 13 or 14, characterized in that  
25 the removal is carried out by grinding, turning or milling.

16. The method as claimed in one of claims 1 to 15, characterized in that,  
30 in one refinement of the crankshaft segment to be processed, and which is in the form of a catenary, the continuous junction radii which are in the form of an initial contour are compressed by the introduction of the intrinsic compressive stresses via the striking  
35 tools (14'), and the junction radii are then processed to the required final contour, as a catenary shape, by a method for removing material from the surface.

17. The method as claimed in one of claims 1 to 16,  
characterized in that,  
in one refinement of the crankshaft segment to be  
processed and in the form of a catenary, the striking  
5 tools (14) are provided with the desired catenary  
shape.

18. The method as claimed in claim 17,  
characterized in that  
10 the catenary shape of a striking tool (14) is formed on  
a plane which extends in the longitudinal direction of  
the crankshaft (4), while a spherical shape is formed  
on a plane at right angles to the longitudinal  
direction.

15 19. The method as claimed in one of claims 1 to 18,  
characterized in that  
the pulsed-pressure apparatuses or striking machines  
(1) are each aligned with their longitudinal axes in  
20 the striking direction, and in that the intrinsic  
compressive stresses are introduced by in each case  
only one striking tool (14), which is arranged in the  
associated pulsed-pressure apparatus or striking  
machine (1).

25 20. An apparatus for carrying out the method as  
claimed in claims 1 to 19 by means of a pulsed-pressure  
machine or striking apparatuses, which pulsed-pressure  
machine is provided with striking tools and with a  
30 transmission for rotation of the crankshaft,  
characterized in that  
the transmission (3') is provided with a continuous  
drive (6) for rotational movement of the crankshaft  
(4), in which case the drive system can be stressed in  
35 a sprung manner.